AMENDMENT UNDER 37 C.F.R. § 1.312 Attorney Docket No.: Q91745
U.S. Application No.: 10/558,369

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AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application:

LISTING OF CLAIMS:

1. (previously presented): A method of producing a silicon carbide single crystal comprising:

storing a sublimation raw material on a first end portion in a reaction container;

disposing a seed crystal of a silicon carbide single crystal on a second end portion substantially facing the sublimation raw material in the reaction container; and

re-crystallizing the sublimated sublimation raw material on the seed crystal to grow a silicon carbide single crystal,

wherein a sealing portion is provided for covering the single crystal growth possible region in the reaction container to grow a silicon carbide single crystal on the seed crystal provided in the sealing portion while preventing the leak of the sublimated sublimation raw material from the atmosphere for sublimation.

2. (original): The method of producing a silicon carbide single crystal according to claim 1, wherein the thermal expansion coefficient of the sealing portion is substantially the same as that of the seed crystal.

3. (original): The method of producing a silicon carbide single crystal according to claim 2, wherein the material of the sealing portion is a graphite.

Claim 4 (canceled).

5. (previously presented): The method of producing a silicon carbide single crystal according to claim 1, comprising

growing the silicon carbide single crystal while maintaining the whole growing surface in a convex shape throughout all growth processes.

6. (previously presented): The method of producing a silicon carbide single crystal according to claim 1, comprising

growing the silicon carbide single crystal while the entire surface excluding the growth surface contacts the sealing portion throughout all growth processes.

7. (original): The method of producing a silicon carbide single crystal according to claim 5,

wherein a crystal of silicon carbide containing a silicon carbide single crystal is grown approximately in a protruded shape.

8. (original): The method of producing a silicon carbide single crystal according to claim 5, comprising

growing the crystal of silicon carbide containing a silicon carbide single crystal while maintaining the approximate protruded shape and,

wherein the diameter of the crystal of silicon carbide decreases gradually toward the sublimation raw material throughout all the growth processes.

9. (previously presented): The method of producing a silicon carbide single crystal according to claim 1, comprising

growing the silicon carbide single crystal only in regions of the second end portion excluding parts adjacent to the peripheral wall surface portion of the reaction container.

10. (previously presented): The method of producing a silicon carbide single crystal according to claim 6,

wherein the crystal of silicon carbide containing a silicon carbide single crystal is composed only of a silicon carbide single crystal.

11. (previously presented): The method of producing a silicon carbide single crystal according to claim 5, comprising:

storing a sublimation raw material on the first end portion side in the reaction container;

disposing a seed crystal for a silicon carbide single crystal on the second end portion side in the reaction container;

forming the sublimation atmosphere so as to enable sublimation of the sublimation raw material by a first heating means disposed on the first end portion side; and

forming the re-crystallization atmosphere such that the sublimation raw material sublimated by the first heating means is re-crystallized only in the vicinity of the seed crystal of the silicon carbide single crystal by a second heating means disposed on the second end portion side so as to re-crystallize the sublimation raw material on the seed crystal of the silicon carbide single crystal.

12. (original): The method of producing a silicon carbide single crystal according to claim 11,

wherein the temperature of the re-crystallization atmosphere is lower than the temperature of the sublimation atmosphere by 30 to 300°C, in the reaction container.

13. (previously presented): The method of producing a silicon carbide single crystal according to claim 11,

wherein the first heating means and the second heating means are an induction-heatable coil.

14. (original): The method of producing a silicon carbide single crystal according to claim 13,

wherein the current value of the induction heating current in the first heating means is larger than the current value of the induction heating current in the second heating means.

15. (previously presented): The method of producing a silicon carbide single crystal according to claim 13,

wherein the current value of the induction heating current in the second heating means is decreased continuously or gradually with the increase of the diameter of a growing silicon carbide single crystal.

16. (previously presented): The method of producing a silicon carbide single crystal according to claim 11,

wherein if the temperature at one end side accommodating a sublimation raw material is represented by T_1 and the temperature at another end side at which a seed crystal of a silicon carbide single crystal is placed is represented by T_2, in the reaction container, and the temperature of the part adjacent to the inner peripheral side surface part of the reaction container at said another end side is represented by T_3, then, T_3-T_2 and T_1-T_2 increase continuously or gradually.

17. (previously presented): The method of producing a silicon carbide single crystal according to claim 13,

wherein an interference preventing means capable of flowing the induction current and preventing interference between the first heating means and the second heating means by flowing the induction current is placed between the first heating means and the second heating means.

18. (original): The method of producing a silicon carbide single crystal according to claim 17, wherein the interference preventing means is a coil through which cooling water can flow.

19. (previously presented): The method of producing a silicon carbide single crystal according to claim 11, wherein the one end is a lower end and another end is an upper end.

20. (previously presented): The method of producing a silicon carbide single crystal according to claim 11, wherein the reaction container is a crucible placed in a quartz tube.

21. (previously presented): The method of producing a silicon carbide single crystal according to claim 11, wherein an inner side region adjacent to the region for carrying out the silicon carbide single crystal growth in the second end portion and an outer side region on the outer circumference of the inner side region are provided as independent members such that one end of the member forming the inner side region is contacted with a sealing portion provided in the reaction container and the other end is exposed to the outside of the reaction container.

22. (previously presented): The method of producing a silicon carbide single crystal according to claim 1, wherein the surface of the part adjacent to the peripheral side surface part in the reaction container at another end is made of glassy carbon.

23. (previously presented): The method of producing a silicon carbide single crystal according to claim 5, wherein the sublimation raw material is a silicon carbide powder obtained by

using as a silicon source at least one compound selected from high purity alkoxysilanes and alkoxysilane polymers, as a carbon source a high purity organic compound generating carbon by heating;

uniformly mixing the silicon source and the carbon source to obtain a mixture; and

calcinating the resulted mixture by heating under a non-oxidizing atmosphere.

24. (previously presented): The method of producing a silicon carbide single crystal according to claim 5, wherein the sublimation raw material is a silicon carbide powder obtained by

using as a silicon source a high purity alkoxysilane, as a carbon source a high purity organic compound generating carbon by heating;

uniformly mixing the silicon source and the carbon source to obtain a mixture; and

calcinating the resulted mixture by heating under a non-oxidizing atmosphere.

25. (previously presented): The method of producing a silicon carbide single crystal according to claim 5, wherein the sublimation raw material is a silicon carbide powder obtained by

using as a silicon source at least one of a high purity alkoxysilane and a polymer of a high purity alkoxysilane, as a carbon source a high purity organic compound generating carbon by heating;

uniformly mixing the silicon source and the carbon source to obtain a mixture; and

calcinating the resulted mixture by heating under a non-oxidizing atmosphere.

26. (previously presented): The method of producing a silicon carbide single crystal according to claim 5, wherein the sublimation raw material is a silicon carbide powder obtained by

using as a silicon source at least one compound selected from the group consisting of high purity methoxysilane, high purity ethoxysilane, high purity propoxysilane and high purity butoxysilane, as a carbon source a high purity organic compound generating carbon by heating;

uniformly mixing the silicon source and the carbon source to obtain a mixture; and

calcinating the resulted mixture by heating under a non-oxidizing atmosphere.

27. (previously presented): The method of producing a silicon carbide single crystal according to claim 5, wherein the sublimation raw material is a silicon carbide powder obtained by

using as a silicon source at least one compound selected from the group consisting of high purity methoxysilane, high purity ethoxysilane, high purity propoxysilane and high purity butoxysilane, and a polymer of them having a polymerization degree of 2 to 15, as a carbon source a high purity organic compound generating carbon by heating;

uniformly mixing the silicon source and the carbon source to obtain a mixture, and calcinating the resulted mixture by heating under a non-oxidizing atmosphere.

28. (previously presented): The method of producing a silicon carbide single crystal according to claim 5, wherein the sublimation raw material is a silicon carbide powder obtained by

using as a silicon source at least one of compound selected from the group consisting of high purity monoalkoxysilanes, high purity dialkoxysilanes, high purity trialkoxysilanes and high purity tetraalkoxysilanes, and a polymer of them having a polymerization degree of 2 to 15, as a carbon source a high purity organic compound generating carbon by heating;

uniformly mixing the silicon source and the carbon source to obtain a mixture; and

calcinating the resulted mixture by heating under a non-oxidizing atmosphere.

29. (previously presented): The method of producing a silicon carbide single crystal according to claim 23, wherein the silicon source is a tetraalkoxysilane polymer and the carbon source is a phenol resin.

30. (previously presented): The method of producing a silicon carbide single crystal according to claim 23, wherein each content of impurity elements in the silicon carbide powder is 0.5 ppm or less.

31-33. (canceled).

34. (canceled).

35. (currently amended): The silicon carbide single crystal production apparatus according to claim ~~34~~40, wherein the sealing portion comprises a bottom portion having a first surface to substantially face to the sublimation raw material for allowing the installation of the seed crystal at the time of being provided on the reaction container main body and a second surface facing the lid portion, and a wall portion provided upright from the rim portion circumference of the first surface of the bottom portion so as to form the hollow portion together with the first surface of the bottom portion, such that the single crystal growth possible region of the circumferential side portion of the reaction container is covered at the time the first surface of the bottom portion is provided in the reaction container substantially facing the sublimation raw material.

36. (original): The silicon carbide single crystal production apparatus according to claim 35, wherein the material of the sealing portion is a graphite.

37. (currently amended): The silicon carbide single crystal production apparatus according to claim 40~~34~~, further comprising:

a first induction heating coil disposed in a spirally wound state on the outer circumference of the portion for storing the sublimation raw material in the crucible for forming the atmosphere for sublimation for allowing sublimation of the sublimation raw material; and

a second induction heating coil disposed in a spirally wound state on the outer circumference of the portion for storing the seed crystal in the crucible for forming the re-crystallization atmosphere for re-crystallization for allowing the re-crystallization of the sublimation raw material sublimated by the first induction heating coil only in the vicinity of the seed crystal of the silicon carbide single crystal to re-crystallize the sublimation raw material on the seed crystal of the silicon carbide single crystal.

38. (original): The silicon carbide single crystal production apparatus according to claim 37, wherein an interference preventing means is disposed between the first heating means and the second heating means, capable of supplying an induction electric current and preventing the interference between the first induction heating means and the second induction heating means by supplying the induction electric current.

39. (original): The silicon carbide single crystal production apparatus according to claim 38, wherein the interference preventing coil is a coil allowing passage of the cooling water.

40. (new): A silicon carbide single crystal production apparatus, comprising at least a crucible having a reaction container main body capable of storing a sublimation raw material; a lid portion provided detachably to the reaction container main body; and a sealing portion inside the reaction container having substantially the same thermal expansion coefficient as that of the seed crystal, capable of placing a silicon carbide single crystal, for preventing the leak of the sublimated sublimation raw material.